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Notes on Mexican Herpetofauna 20: Potential Herpetofaunal Predators of <i>Gerrhonotus parvus</i> in the San Isidro Canyon, Santiago, Nuevo León, Mexico	Javier Banda-Leal, David Lazcano, Manuel Nevárez-de los Reyes and Carlos Barriga-Vallejo	17
An Improved Husbandry Setup for Cold-water Amphibians	Richard L. Essner, Jr., Michael E. Jorgensen, Bradley W. Ringer, Stevie J. Wright and Stephen M. Reilly	24
What You Missed at the January Meeting	John Archer	27
Unofficial Minutes of the CHS Board Meeting, January 17, 2014		30
News and Announcements: 2014 CHS Grant Recipients		31
Advertisements		32

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Notes on Mexican Herpetofauna 20: Potential Herpetofaunal Predators of *Gerrhonotus parvus* in the San Isidro Canyon, Santiago, Nuevo León, Mexico

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Abstract

We present a systematic list of the amphibians and reptiles of San Isidro Canyon in the Parque Nacional Cumbres de Monterrey, Municipality of Santiago, Nuevo León. This area is unique within the park in supporting a population of *Gerrhonotus parvus*, a species that is endemic to the state of Nuevo León and is listed in the Official Norm Mexicana NOM-059-SEMARNAT-2010 under the categories of Special Protection and Endemic to Mexico and in the Red List of the International Union for the Conservation of Nature (IUCN) as endangered. The species is also known from the municipalities of Galeana, Los Rayones and Santiago. The objective of this research is to identify herpetofaunal species that may be potential predators of *G. parvus*. The site was surveyed between 1999 and 2013. The list contains 44 species, 31 of which we consider to be potential predators of *G. parvus*. Natural disasters and anthropogenic factors may also place ecological pressure on the population in of San Isidro Canyon.

Resumen

Se presenta una lista sistemática de los anfibios y reptiles del Cañón de San Isidro, ubicado en el Parque Nacional Cumbres de Monterrey en la sección del Municipio de Santiago, Nuevo León durante un período de colecta comprendido de 1999 a 2012. Esta área es la única dentro del Parque donde se localiza a *Gerrhonotus parvus*, una especie endémica de Nuevo León, conocida solo para los municipios de Galeana, Los Rayones y Santiago. La intención de este trabajo es conocer las especies de herpetofauna que pueden ser potenciales depredadores de *G. parvus*, que esta enlistada en la Norma Oficial Mexicana NOM-059-SEMARNAT-2010 bajo la categoría de Protección Especial, Endémica y que figura en la Lista Roja de la Unión Internacional para la Conservación de la Naturaleza (UICN) como en peligro. El listado consta de 44 especies, de las cuales consideramos 31 pueden ser en algún momento depredadores de esta especie. Así mismo debido a factores como desastres naturales y antropogénicos la presión ecológica sobre esta población del Cañón de San Isidro se ve incrementada.

Introduction

Predators are organisms that survive by eating other living animals either of the same or different species. They often have a choice of which prey to attack, and the traditional assumption is that predators generally pursue animals that are old, young, or slow and disabled Siiter (1999). Therefore predation is a necessary natural process for the survival of these predators and it eliminates the less apt individuals of the species. All serpents are carnivorous, and in general can consume a diversity of food items; they include generalists and specialists. There are many predators involved in the predator-prey dynamics, and olfaction plays a major role in detecting prey (Conover, 2007).

Anguids exhibit two foraging modes: active foraging (Vitt and Pianka, 1994), and “ambush”, “sit-and-wait” or “passive foraging” (waiting for a prey to come within sight) (Pianka, 1966; Vitt and Price, 1982). It is often assumed that anguids are active foragers, even though the behaviors of members of this family are poorly known. We are studying anguid behavior in

the field and laboratory.

On the other hand phrynosomatid lizards consume primarily invertebrates (Pianka and Vitt, 2003) and utilize an ambush (sit-and-wait) foraging mode (Vitt and Pianka 1994).

We found only a few publications (8) on *Gerrhonotus parvus*:

- Smith (1986) proposed a taxonomic change of *Gerrhonotus parvus* to *Elgaria parva* based on similarity of the head scalation to other members of this genus.
- Banda et al. (2002) documented a new locality for *G. parvus* (as *Elgaria parva*) in San Isidro Canyon, discussed the morphology and taxonomic rank of the species, and provided a description of the habitat that differs significantly from the type locality in Galeana, Nuevo León. San Isidro Canyon is a limestone canyon at an altitude of 1600 m. The first specimen was found on the floor of the canyon beside a rock wall, with decomposing organic matter as a substrate.

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- Bryson et al. (2003) documented several natural history aspects of *G. parvus* at the type locality and San Isidro Canyon with notes on some sympatric herpetofaunal species in the area.
- Banda-Leal et al. (2005) registered the largest known specimen from San Isidro Canyon, Santiago, Nuevo León, and the largest reported *G. parvus*. Previously the paratype from Galeana was the largest specimen, as reported by Knight and Scudday (1985) with 71.7 mm. SVL. It was maintained in captivity for about 5 years and was deposited in the collection at the Sull Ross University. A new specimen measured 76.5 mm (SVL), exceeding the paratype by 4.8 millimeters. This larger specimen was found in May at the base of the branch canyon which at that time was flooded. The specimen had recently left a water pond; unfortunately it died, and apparently had drowned. Lizards in branch canyons are at risk due to flooding of the area and formation of deep ponds.
- Conroy et al. (2005) used Bayesian analysis of DNA sequences to determine the phylogenetic position of *E. parva*, finding it to be the sister of *Gerrhonotus infernalis* and proposed placing it in the genus *Gerrhonotus* (rather than *Elgaria*, as originally described by Knight and Scudday [1985]).
- Lazcano and Bryson (2010) registered the occurrence of juvenile *G. parvus* for the first time in the San Isidro Canyon. The juvenile described had a complete tail and its coloration was very different from the adults, consisting of clear and very dark bands that are strongly contrasting, whereas the adults have bands that are not contrasting. The young are very different from young of the sympatric *G. infernalis*, which are very similar to adults of *G. infernalis*.
- Banda-Leal et al (2013) reported on the sympatric herpetofauna in the area.

- Bryson and Graham (2010) described *Gerrhonotus farri*, which falls within the group of small anguids that we have proposed.

Study Site

San Isidro Canyon is located in what is known as the Curvature of Monterrey and is within the Protected Natural Area known as Parque Cumbres de Monterrey, Nuevo León, in the municipality of Santiago. This canyon is located southwest of the municipality and is contiguous to the south with the state of Coahuila. The canyon is approximately 2 km in length, at an elevation of 1600 m with numerous rock walls that are about 400 m in height. It is constituted of limestone, and the walls have elements of desert *rosetófila* vegetation: *Agave lecheguilla* (lechuguilla), *Agave bracteosa* (squid agave), and *Dasylium* sp. (sotol). The canyon floor mainly contains submontano elements such as: *Helietta parvifolia* (barreta), *Chilopsis linearis* (desert willow), *Cercis canadensis* (eastern redbud), *Gochnatia hypoleuca* (shrubby bullseye) and *Acacia rigidula* (blackbrush acacia), *Acacia farnesiana* (sweet acacia), *Acacia berlandieri* (Berlandier's acacia) and several oak species (*Quercus* spp.). There is a gallery forest with a distinguishing element *Platanus occidentalis* (American sycamore) throughout the canyon. There is almost always water present, but in the dry season the water flow may be intermittent. In branch canyons small pools may form. We have found several of our specimens, including a neonate, in these branch canyons.

Materials and Methods

The list of potential herpetofauna predators of *G. parvus* was constructed using records found in the literature from the area of the Municipality of Santiago, Nuevo León, and field work in the

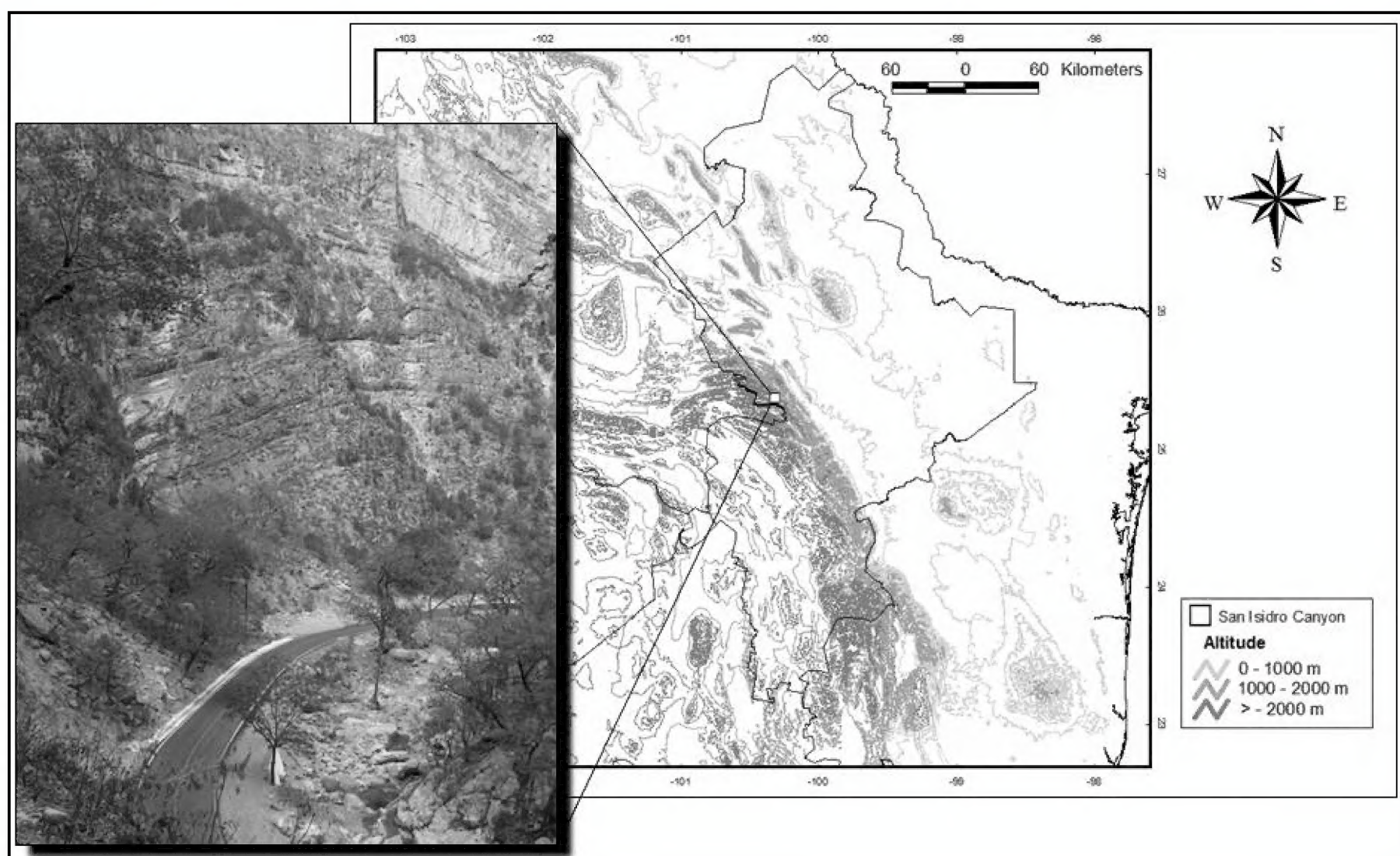


Figure 1: San Isidro Canyon, Santiago, Nuevo León, Mexico.

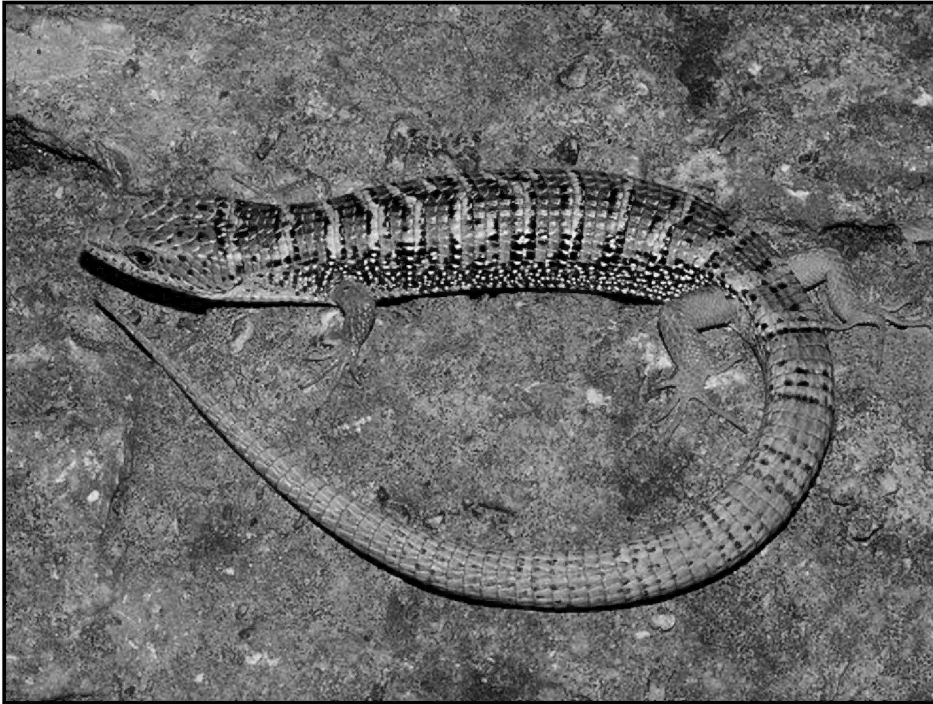


Figure 2. *Gerrhonotus parvus* male. UANL-6996. Photograph by Manuel Salazar-González.

study area since 1999. Authors from the Laboratory of Herpetology of the Faculty of Biological Sciences of the UANL and other herpetologists, mainly North American, have visited the study area about 4 or 5 times per year, monitoring species of the area in the past years and continuing into the present.

Results

From these field trips we took 15 pygmy alligator lizards (6 preserved and 9 kept alive in the laboratory) and found 22 specimens that were liberated in situ after data were taken. Of these, three were offspring, weighing 0.4, 0.63 and 0.98 g. Our adults can weigh up to 11 g. Specimens were located under dead plant matter and in crevices or active on the canyon floor close to the walls. All specimens were found from March to October.

On 7 May 2004, during a visit to the area, an adult *G. infernalis* was observed consuming a juvenile *G. parvus*, (pers. obs. by one of the authors). Due to the irregularity of the terrain the specimen could not be captured and escaped into crevices of the canyon rock walls.

A total of 31 (70.5%) of the 44 herpetofaunal species listed from the area are potential predators on *G. parvus*. They could at some point put pressure on this population of *G. parvus*.



Figure 4. *Gerrhonotus parvus* juvenile. UANL-7320. Photograph by Manuel Salazar-González.

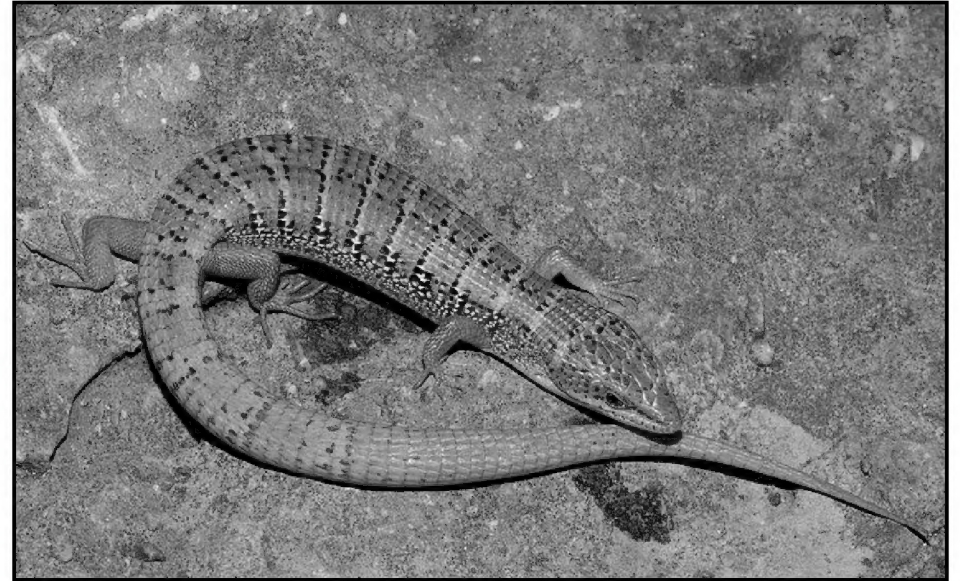


Figure 3. *Gerrhonotus parvus* female. UANL-7274. Photograph by Manuel Salazar-González.

Discussion

Species that may be consuming *G. parvus* are those, such as *Micrurus tener*, that have a specialized diet of lizards and other reptiles, or that often include them in their diet (Roze, 1999). *Micrurus tener* has been documented feeding on *Tantilla* sp. (Greene, 1997). Snakes of other genera, such as *Coluber constrictor oaxaca*, *Coluber schotti ruthveni*, *Coluber flagellum testaceus*, *Salvadora grahamiae lineata*, and *Lampropeltis m. mexicana*, prey upon lizards, as well as insects, frogs, others snakes, rodents, and birds (Greene, 1997; Reams and Aucone, 2001). The diet of these species changes during ontogeny.

Although *Lampropeltis* species feed on a wide range of vertebrates, lizards form an important part of their diet (Lemos-Espinal and Smith, 2007). Parham and Feldman (2003) observed a *Lampropeltis zonata* consuming a specimen of *Elgaria multicarinata*; Ashton and Smith (1999) report that a *Lampropeltis triangulum blanchardi*, which feeds primarily on mammals, was observed preying on a *Aspidoscelis angusticeps*.

Rossman et al. (1996) mentions that *Thamnophis proximus diabolicus* mainly feeds on amphibians, but on one occasion consumed a *Scincella lateralis*. *Thamnophis cyrtopsis cyrtopsis* is an inhabitant living in canyons and is a specialist feeding on amphibians, but occasionally this species' diet may include lizards, particularly in the dry season.



Figure 5. *Gerrhonotus parvus* habitat in San Isidro Canyon. Photograph by Javier Banda-Leal.

Trimorphodon tau tau also feeds frequently on lizards, including species of great size such as *Sceloporus cyanogenys* (Contreras-Lozano, 2006); it may also consume *Aspidoscelis scalaris gularis*, *G. infernalis*, *G. parvus*, *Plestiodon pineus*, *Sceloporus oregon*, *Sceloporus torquatus binocularis* and *Scincella silvicola caudaequinae*. These frequently share the same microhabitat. Another potential predator is *Opheodrys aestivus majalis* which is arboreal and has a diet that includes lizards; it may prey on *G. parvus* in vertical environments of the area.

Rattlesnakes, particularly *Crotalus lepidus lepidus*, are important predators of vertebrates in the area and include lizards as food items. *Sceloporus jarrovi jarrovi* and *Cophosaurus texanus scitulus* have been reported as part of the diet of this species (Bryson et al., 2002; Mata-Silva et al., 2011). Because of their size *C. l. lepidus* may consume any age category and are likely to feed on *G. parvus* adults. It has been documented that *Crotalus l. lepidus* includes anguids as a food item, as Banda-Leal et al. (2004) found scales and bones of *Barisia ciliaris* in the feces. Lazcano et al. (2004) documented finding a dead *C. l. lepidus* with a *Sceloporus parvus* in its mouth on the road in San Isidro Canyon. Mata-Silva et al. (2010) observed a *C. l. lepidus* feeding on a *Hypsiglena jani texana*.

Juvenile *Crotalus molossus molossus* also could be consuming *G. parvus*, although this species is not common in the canyon. Although *Crotalus atrox* consumes mammals, it can also feed on lizards. Repp and Schuett (2009), during a telemetry study, observed *C. atrox* preying on *Phrynosoma solare* and *Sceloporus magister*. It is possible that in the San Isidro Canyon, juvenile *C. atrox* may feed on lizards such as *Sceloporus t. binocularis*, *S. oregon*, *S. couchii*, *G. parvus* and *G. infernalis*. In another example Garcia-Padilla et al. (2011) documented *Crotalus tortugensis* eating *Sceloporus orcutti*, adding to our recognition that rattlesnakes are important predators of lizards.

Hypsiglena jani texana is small snake that may prey on *G. parvus*. In Colima, in 2010, one of the authors (pers. obs.) found a *Hypsiglena torquata* preying on an *Aspidoscelis lineatissima*, indicating that slower lizards such as anguids are likely included as food items.

Gerrhonotus infernalis is the only species confirmed to prey on *G. parvus*. It is a considerably larger and very aggressive species that frequents the same microhabitat: the bases of the canyon walls, crevices, and decomposing organic matter, including yucca trunks, leaf litter, dead squid agave, and sotol that lie on the floor of the canyon. It also prefers shaded sites and avoids sunny areas; this species is likely to encounter *G. parvus*. Another anguid, *Barisia ciliaris*, is also a potential predator species that lives in the area and prefers shaded sites.

Another common lizard in the area, *Sceloporus couchii*, is smaller, but could be another predator on offspring and juveniles. However this species prefers warmer, sunny areas. We have observed individuals of *S. t. binocularis* and *S. oregon*, after warming in sunny areas, feeding on insects in the cooler, shaded areas of the canyon where *G. parvus* may be present. Perkins et al. (1997) reported finding scales of *Xantusia vigilis*, which occur in yuccas and agaves, a habitat similar to that of *G.*

parvus, in the feces of *S. magister*. Castañeda et al. (2005) reported finding a female *C. texanus* that was eating a small conspecific male. *S. torquatus binocularis* and *S. oregon* frequent the rock walls of canyon, but occasionally visit the floor, where they become common potential predators. In a documented event Köhler and Fried (2012) mention finding a male *Sceloporus variabilis* feeding on a juvenile *Aspidoscelis deppei*, the entire predation event took about 10 minutes.

In addition to predation, other factors that may affect the population of *G. parvus* in the area are natural disasters and anthropogenic pressure. Even though the paved road to Laguna Sánchez, Santiago passes through the middle canyon, the site had remained relatively stable until in July 2010 Hurricane Alex devastated the area, flooded the canyon, and destroyed the road, leaving large impassible areas. Hurricanes are known to cause extraordinary damage to human settlements, but can also be responsible for amphibian and reptile displacement (Censky et al., 1998; Corn, 2005) and decrease populations (Cely, 1991; Woolbright, 1991; Schriever et al., 2009). After the hurricane, repair work on the road was conducted and eroded sites were filled temporarily to make the road passible. The eroded areas are now filled with asphalt and rubble left over from the road repairs. Subsequent to these events no specimens were found until 9 April 2012, when we sighted an adult female at the base of a branch canyon. It was on the side of the road, in a small area of approximately 1 m long by 1 m wide that had no repair residues. The lizard was captured and morphometric measurements were taken. It was released and immediately took refuge in the rock wall.

Conclusion

San Isidro Canyon is now the best known population of *G. parvus*. As a result of our investigations, more specimens have been sighted at this locality than any other. However, the population is under more ecological pressure by the factors discussed above. The number of potential predators is high and the 22 individuals found to date are low for anguid species (Mendoza-Quijano, 1997). Our estimations of potential herpetofaunal predators include snakes and lizards. Amphibian species present at this site were not considered to be predators of *G. parvus*, but this could vary among sites where the species is found.

In late September and early October of 2013, two powerful tropical depressions called “Manuel” and “Ingrid” affected Mexico. In particular Ingrid impacted the state of Nuevo León with intensive precipitation (maximum accumulation of ~750 mm and winds up to ~110 kph), affecting many rural areas of the state, and again destroying the area of San Isidro Canyon that had been reconstructed after Hurricane Alex. These two meteorological events, with precipitation greater than has been experienced in the last 50 years of observations, together affected the entire territory, destroying many rural communities, and increasing river flow. The effect on wildlife and natural protected areas has yet to be documented.

Acknowledgments

We wish to thank the multiple national and international institutions that supplied their collection data for this specific

area, allowing us to update the herpetofaunal list of San Isidro Canyon; the Universidad Autónoma de Nuevo León and San Antonio Zoo for financial support of this study; SEMARNAT for issuing collecting permit including most recently Oficio Num. SGPA/DGVS/01589/13 and Oficio Num. SGPA/DGVS/10021/13. We would also like to thank all the persons that participated in lab and field work. In particular Dr. Robert L.

Bezy and Dr. Robert W. Bryson Jr., for their comments to this manuscript, Alejandro Huereca-Delgado for help in the field work and Manuel Salazar for the photographs of the specimens, and the authorities of Parque Nacional Cumbres de Monterrey. Especial thanks to Javier Escalera-Garza for providing the use of the “El Cilantrillo” cabins during this study.

Table 1. Species reported in national and international collections for San Isidro Canyon and surrounding areas. NOM = protection status in the Mexican NOM-059-SEMARNAT-2010: A = *Amenazada* (Threatened); Pr = *Protección Especial* (Special Protection); SE = *Sin Estatus* (No Status). IUCN = status in the IUCN Red List of Threatened Species: LC = Least Concern, NT = Near Threatened, V = Vulnerable, E = Endangered. An X in the column headed PP denotes a potential predator on *Gerrhonotus parvus*. Common and scientific names follow Liner and Casas-Andreu (2008).

Taxon	Common Name in English	Status		PP
		NOM	IUCN	
Amphibia: Anura				
Family Bufonidae				
<i>Anaxyrus punctatus</i> (Baird and Girard, 1852)	Red-spotted Toad	SE	LC	
<i>Ollotis nebulifer</i> (Girard, 1854)	Gulf Coast Toad	SE	LC	
Family Eleutherodactylidae				
<i>Eleutherodactylus cystignathoides campi</i> (Stejneger, 1915)	Spotted Chirping Frog	SE	LC	
<i>Eleutherodactylus longipes</i> (Baird, in Emory, 1869)	Long-footed Chirping Frog	SE	V	
Family Hylidae				
<i>Ecnomihyla miotympanum</i> (Cope, 1863)	Small-eared Treefrog	SE	NT	
<i>Smilisca baudinii</i> (A. M. C. Duméril and Bibron, 1841)	Mexican Treefrog	SE	LC	
Family Scaphiopodidae				
<i>Scaphiopus couchii</i> Baird, 1854	Couch's Spadefoot	SE	LC	
Reptilia: Squamata—Lizards				
Family Anguidae				
<i>Barisia ciliaris</i> (H. M. Smith, 1942)	Northern Alligator Lizard	Pr	LC	X
<i>Gerrhonotus infernalis</i> Baird, 1859 (1858)	Texas Alligator Lizard	Pr	LC	X
<i>Gerrhonotus parvus</i> Knight and Scudday, 1985	Pigmy Alligator Lizard	Pr	E	
Family Phrynosomatidae				
<i>Sceloporus couchii</i> Baird, 1859 (1858)	Couch's Spiny Lizard	SE	LC	X
<i>Sceloporus grammicus disparilis</i> Stejneger, 1916	Northeastern Graphic Lizard	Pr	LC	X
<i>Sceloporus oregon</i> H. M. Smith and B. C. Brown, 1941	Royal Lesser Minor Lizard	SE	V	X
<i>Sceloporus parvus</i> H. M. Smith, 1934	Northern Blue-bellied Lizard	SE	LC	X
<i>Sceloporus torquatus binocularis</i> Dunn, 1936	Nuevo Leon Torquate Lizard	SE	LC	X
Family Scincidae				
<i>Plestiodon pineus</i> (R. W. Axtell, 1960)	Pine Woods Short-nose Skink	SE	LC	
<i>Scincella silvicola caudaequinae</i> (H. M. Smith, 1950)	Horsetail Falls Ground Skink	Pr	LC	
Family Teiidae				
<i>Aspidocelis scalaris gularis</i> (Baird and Girard, 1852)	Texas Spotted Whiptail	SE	LC	X
Family Xantusiidae				
<i>Lepidophyma sylvaticum</i> E. H. Taylor, 1939	Madrean Tropical Night Lizard	Pr	LC	
Reptilia: Squamata—Snakes				
Family Colubridae				
<i>Coluber constrictor oaxaca</i> (Jan, 1863)	Mexican Racer	A	LC	X
<i>Coluber flagellum testaceus</i> Say, in James, 1823	Western Coachwhip	A	LC	X
<i>Coluber schotti ruthveni</i> (Ortenburger, 1923)	Ruthven's Whipsnake	SE	LC	X
<i>Drymarchon melanurus erebennus</i> (Cope, 1860)	Texas Indigo Snake	SE	LC	X

Table 1 (cont'd).

Taxon	Common Name in English	Status		PP
		NOM	IUCN	
<i>Drymobius margaritiferus margaritiferus</i> (Schlegel, 1837)	Northern Speckled Racer	SE		X
<i>Hypsiglena jani texana</i> Stejneger, 1893	Texas Nightsnake	Pr	LC	X
<i>Lampropeltis mexicana mexicana</i> (Garman, 1884 [1883])	San Luis Potosí Kingsnake	A	LC	X
<i>Leptodeira septentrionalis</i> (Kennicott, in Baird, 1859)	Northern Cat-eyed Snake	SE		X
<i>Opheodrys aestivus majalis</i> (Baird and Girard, 1853)	Western Rough Greensnake	SE	LC	X
<i>Pantherophis bairdi</i> (Yarrow, in Cope, 1880)	Baird's Ratsnake	SE	LC	X
<i>Pituophis deppei jani</i> (Cope, 1861 [1860])	Northern Mexican Pinesnake	A	LC	X
<i>Rhadinaea montana</i> H. M. Smith, 1944	Nuevo León Graceful Brown Snake	Pr	E	X
<i>Rhinocheilus lecontei</i> Baird and Girard, 1853	Long-nosed Snake	SE	LC	X
<i>Salvadora grahamiae lineata</i> Schmidt, 1940	Texas Patch-nosed Snake	SE	LC	X
<i>Senticolis triaspis intermedia</i> (Boettger, 1883)	Northern Green Ratsnake	SE	LC	X
<i>Storeria hidalgoensis</i> E. H. Taylor, 1942	Mexican Yellow-bellied Brownsnake	SE	V	X
<i>Tantilla rubra</i> Cope, 1876 (1875)	Red Black-headed Snake	Pr	LC	
<i>Thamnophis cyrtopsis cyrtopsis</i> (Kennicott, 1860)	Western Black-necked Gartersnake	SE	LC	X
<i>Thamnophis proximus diabolicus</i> Rossman, 1963	Arid Land Ribbonsnake	A	LC	X
<i>Trimorphodon tau tau</i> Cope, 1870	Mexican Lyresnake	SE	LC	X
<i>Tropidodipsas sartorii sartorii</i> Cope, 1863	Sartori's Snail Sucker	SE	LC	
Family Crotalidae				
<i>Crotalus atrox</i> Baird and Girard, 1853	Western Diamondback Rattlesnake	Pr	LC	X
<i>Crotalus lepidus lepidus</i> (Kennicott, 1861)	Mottled Rock Rattlesnake	Pr	LC	X
<i>Crotalus cf. molossus</i>	Black-tailed Rattlesnake	Pr	LC	X
Family Elapidae				
<i>Micrurus tener</i> (Baird and Girard, 1853)	Texas Coral Snake	Pr	LC	X

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An Improved Husbandry Setup for Cold-water Amphibians

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Introduction

Cold-water amphibians are a diverse group of vertebrates living at high latitudes and/or altitudes worldwide. They frequently reside in highly oxygenated, fast-flowing streams and exhibit a remarkable array of adaptations associated with these challenging environments. General trends in this group include increased use of cutaneous respiration with accessory skin folds and reduced lungs, long life spans with slow growth and development, and low critical thermal maxima (Bury, 2008). Replicating natural conditions for these organisms can present a significant challenge for researchers interested in housing or propagating them (Held, 1985; Essner and Suffian, 2010).

The Rocky Mountain Tailed Frog, *Ascaphus montanus*, is a cold-water amphibian from the Pacific Northwest of the United States and Canada (Figure 1). This unusual species is a member of a basal group of frogs (Family: Leiopelmatidae), that diverged from all other frogs over 200 million years ago (Roelants and Bossuyt, 2005). They are essentially living fossils, having retained morphological and behavioral traits that may be informative in attempts to reconstruct ancestral character states. Their closest living relatives are found in New Zealand (New Zealand Frogs, *Leiopelma* spp.). The disjunct distribution of this family reflects its ancient divergence, which resulted from the breakup of Pangaea (Roelants and Bossuyt, 2005).

Evolutionary Significance

Tailed frogs are a key taxon for addressing evolutionary questions in anuran biology. Unfortunately, a lack of available live specimens in the commercial trade combined with limited husbandry information, have presented a significant barrier to researchers. As a result, evolutionary studies have frequently neglected to include leiopelmatids, focusing instead on more accessible, but highly derived taxa such as *Lithobates* or *Anaxyrus*. This, in turn, has led to broad generalizations regarding anuran behavior that remain largely untested in basal frogs.

One example of the importance of leiopelmatids is in the area of anuran locomotion. Until recently, it had generally been assumed, based on observations of jumping and landing behavior in a few crown group anurans (Bufonidae, Microhylidae, and Ranidae: Emerson and De Jongh, 1980; Gillis et al., 2010; Gillis and Biewener, 2000; Kamel et al., 1996; Nauwelaerts and Aerts, 2006; Peters et al., 1996), that all frogs landed forelimbs-first in a similar manner (Duellman and Trueb, 1994; Emerson and De Jongh, 1980; Peters et al., 1996). However, in a comparative study of landing behavior in leiopelmatid (*Ascaphus*, *Leiopelma*) and lalagobatrachian (*Bombina*, *Lithobates*) frogs, Essner et al. (2010) determined that this description did not fit leiopelmatid frogs. In contrast to all other frogs studied to date, leiopelmatids did not land on adducted forelimbs, but instead exhibited “belly-

flop” landings with delayed limb recovery. These “belly-flop” landings may represent the primitive condition for frogs and are consistent with the riparian origin of jumping, hypothesized by Hecht (1962) and Gans and Parsons (1966).

Methods

Initial Husbandry Setup

We established a research colony of tailed frogs in July 2007 by collecting individuals from streams in the Payette National Forest, Valley County, Idaho and transporting them to Southern Illinois University Edwardsville. (See Essner et al. (2012) for a description of a protocol for maintaining and transporting cold-water amphibians in the field.) With limited husbandry information, our goal was simply to construct a “living stream” setup that replicated the conditions we observed in their natural habitat. Details of this setup are provided in Essner and Suffian (2010). Briefly, frogs and tadpoles were housed separately in rectangular aquaria constructed of wood and painted with marine paint (Figure 2). Substrate consisted of pea gravel and cobbles (5–30 cm). Flow was powered by a submersible pump placed in the bottom of a reservoir tank, with water directed through a network of PVC into a chiller and then into the aquaria or reservoir tank via stopcocks. Water depth was relatively shallow (~7 cm).

This setup allowed us to successfully maintain a colony of tailed frogs for 6 years and produced notable successes, including: 1) successful metamorphosis; 2) development of male nuptial pads; 3) frequent copulexus (amplexus + copulation); 4) female gravidity; and 5) substantial weight gain (>100%; Essner and Suffian, 2010). Unfortunately, we were unable to stimulate oviposition in this setup, despite providing conditions similar to those characterizing oviposition sites in the wild (Karraker et al., 2006). We determined that the most likely factors inhibiting



Figure 1. Rocky Mountain Tailed Frog, *Ascaphus montanus*.

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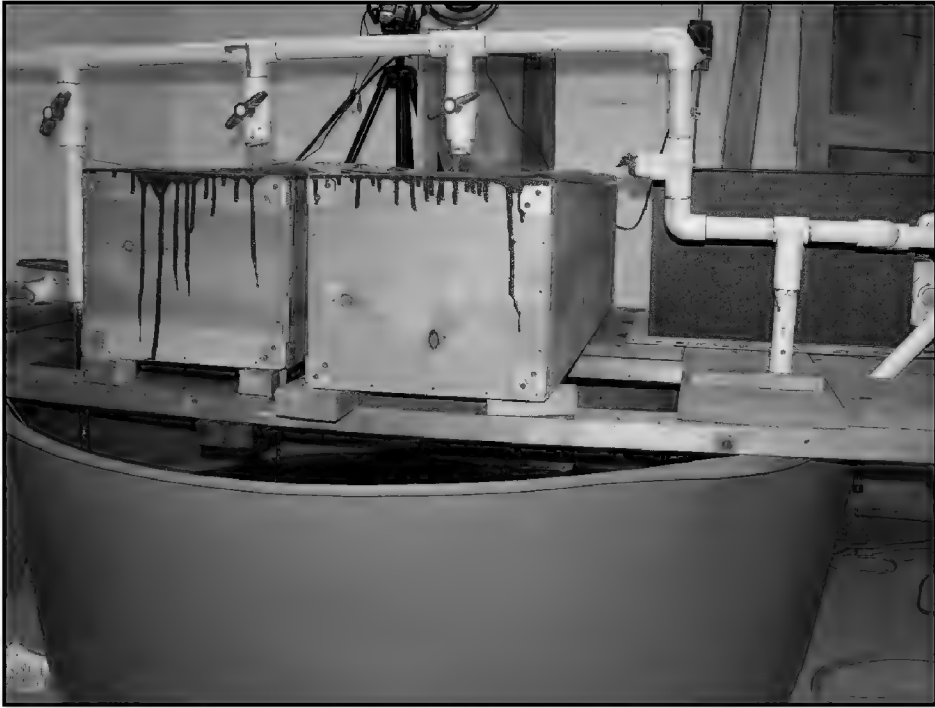


Figure 2. Initial husbandry setup for the Rocky Mountain Tailed Frog, *Ascaphus montanus* (Essner and Suffian, 2010).

oviposition were: 1) low water depth and/or overcrowding; and 2) absence of large rocks suitable for oviposition (Karraker et al., 2006). We subsequently designed a new setup that addressed both of these concerns.

New Husbandry Setup

Our current design uses 379-L stock tanks (Rubbermaid) to house adult frogs and tadpoles/juveniles separately (Figure 3). Flow is driven by a 9085 L/h submersible utility pump (Supreme model 24) placed in the bottom of tank #1. Deionized water is filtered at the intake with a filter canister and sleeve (Marineland Magnum) containing a mixture of activated carbon and ammonia removing media (Aquarium Pharmaceuticals Ammocarb; see Essner and Suffian, 2010). We use 3.3 cm outer diameter schedule 40 PVC to direct flow to a ½ hp chiller (Aqua Logic Delta Star) cycled with a plug-in timer to regulate water temperature. A hole slightly larger than the PVC is cut in the side of the stock tank to allow connection to the chiller's inflow. An additional section of PVC is connected to the chiller's outflow. Holes are cut in the sides of the tank walls at the level of the chiller's outflow to allow passage of PVC through both tanks. A PVC cap is placed on the end protruding through tank #2. Stopcocks are placed over both tanks to allow regulated flow to enter from above. Stock tank drain plugs are removed and a

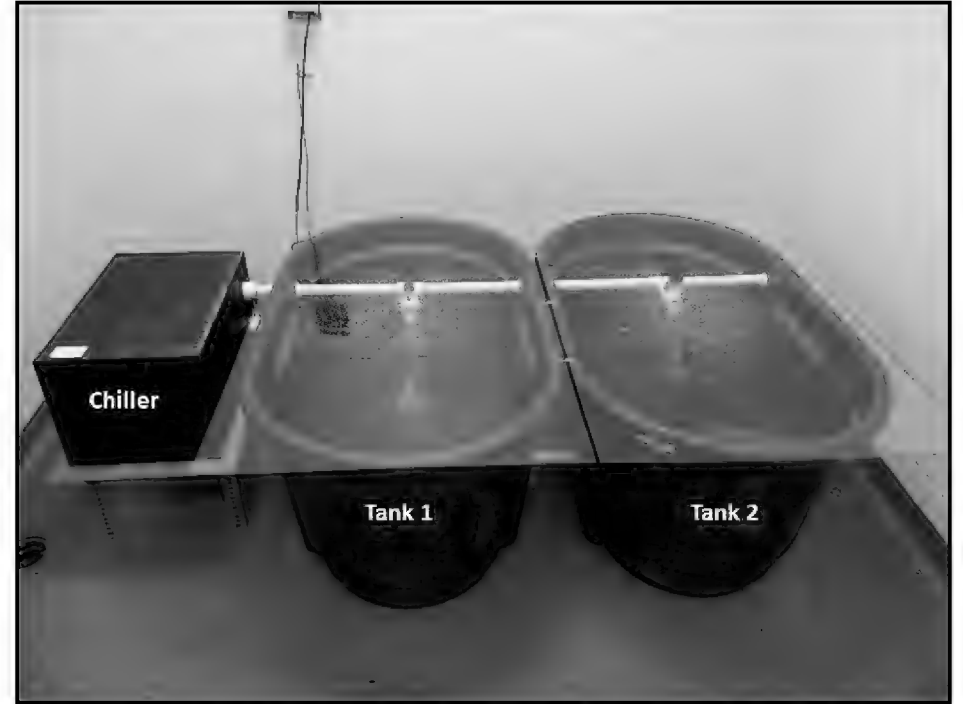


Figure 3. New husbandry setup for the Rocky Mountain Tailed Frog, *Ascaphus montanus*.

final section of PVC is placed between the two tanks to provide drainage for tank #2 (note that tanks should be lined up with drains facing each other). A small piece of window screen is placed over each end of the PVC by fitting a coupler over the window screen at each end. The window screen allows flow to occur, but presents a barrier to animals. Holes are filled with epoxy (J.B. Weld Kwikweld). Each tank is covered by a rectangular section of Plexiglas (0.16 cm) drilled with small holes to provide aeration. Once the epoxy has cured, approximately 40 L of water collected from the streams where the frogs were collected and 460 L of deionized water are added. The stream water is necessary to inoculate the system with periphyton (diatoms and desmids), the exclusive diet of the tadpoles. Pea gravel is placed on the bottom of each tank to provide a natural substrate. Cobbles and boulders collected from the streams where frogs were located are stacked on one end of each tank until they protrude from the water. These provide potential oviposition sites below water and a feeding platform above.

To date, we have constructed two versions of this setup. The first was built in June 2011 at Ohio University where the availability of a cold room obviated the need for a chiller. Oviposition ($n = 3$ clutches) occurred soon after introducing frogs to the setup (Figure 4). To our knowledge, this is the first instance of

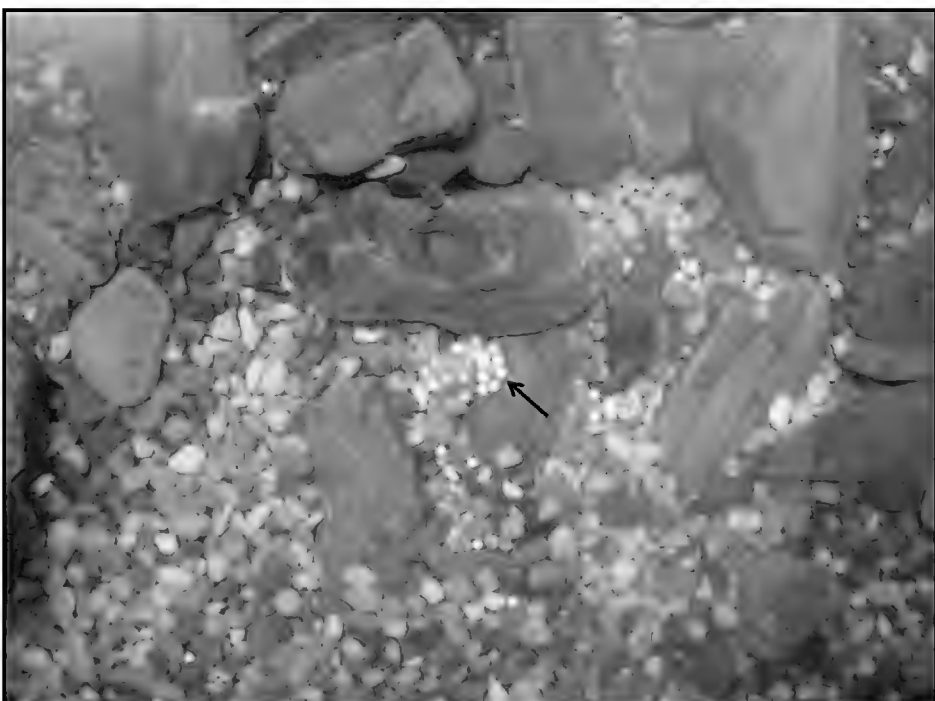


Figure 4. Egg mass (arrow) produced by *Ascaphus montanus* in new husbandry setup.



Figure 5. Hatchling *Ascaphus montanus* tadpoles from new husbandry setup.



Figure 6. *Ascaphus montanus* tadpoles (~one month old) adhered to undersurface of a cobble in new husbandry setup. Note the color change from white to gray.

oviposition in the laboratory for *Ascaphus*, without the use of hormonal induction. The majority of these eggs were viable (~150) and hatching/development proceeded normally (Figures 5 and 6). Unfortunately, the tadpoles experienced a population crash and only a handful of individuals survived after one year. We suspect there was not enough periphyton present to support that many individuals. In the future, supplemental periphyton will be farmed in separate containers and provided as needed. The second setup was built in July 2013 at Southern Illinois University Edwardsville. A cold room was unavailable; there-

fore, a chiller was used as described above. Currently there are approximately 25 adults, 8 juveniles, and 12 tadpoles in the colony. It is too soon to evaluate the success of this setup with respect to oviposition, since it was built after the normal oviposition period for tailed frogs. However, we continue to regulate photoperiod and water temperature in order to mimic the natural cycle and hope that oviposition will occur this summer.

This system is relatively inexpensive and can be built for under \$2000. It presents a number of significant advantages over the previous setup. First, it is a relatively closed system compared to the previous setup which had an open reservoir tank. Consequently, there is less water loss from splashing and evaporation and water quality is more constant. Second, it is quieter than the previous system with water flowing into the tanks below the Plexiglas. Third, the new setup does not use any wood, which is difficult to sanitize and is susceptible to mold and mildew. The system is also flexible, allowing temperature to be controlled by cycling the chiller and flow to be controlled via pump selection or via stopcocks. It should be adaptable to a range of cold-water species.

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What You Missed at the January Meeting

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It's too easy for me to feel like a genius. After 30 minutes at any event where I'm introducing herps to passers-by, I find that I can answer all questions accurately and rapidly. Of course most of the questions are simply "Does it bite?" and "Is it poisonous?" but by the end of the event I'm pretty sure I know everything, at least about herps. I'll take credit for the efforts I put into studying the subjects I care about, including herps, but I quickly realize that I have yet to scratch the surface on most subjects I pursue, especially herps. Nevertheless, I still occasionally let my head swell, which invariably leads to a rapid and often embarrassing unplanned deflation.

So I saw the title of January's talk and decided that I knew what our speaker would say. The talk was titled "Amphibians and Global Change. What Do We Stand to Lose?" I've been into herps for a while. I've read papers and listened to speakers. I know that many amphibians are in peril. I think I have a good idea of the suspected causes and the reasons we should care. But if the argument got technical I couldn't build a solid case based on published data. Dr. Joseph Milanovich was going to correct that.

Dr. Milanovich arrived in the Chicago area last year to become an assistant professor at Loyola University. He promptly joined the CHS and graciously consented to giving a presentation. He came to Chicago from Cincinnati where he did post-doc work while working for the U.S. Environmental Protection Agency. Here's the description of his current research on his lab's website:

Our research focuses on understanding the effect of land-use and climate change on, and the ecological role of, communities—in both natural and urban ecosystems. Our primary goal is to help understand the importance of biotic communities to ecosystem function and service, but the majority of our research endeavors focus on amphibians and reptiles in aquatic and terrestrial ecosystems. Research in the Milanovich Lab is primarily field based; however, we utilize a number of computer-based and laboratory techniques, such as species distribution models, ecological stoichiometry, and stable isotope analysis to study community and landscape-level interactions.

I had to look up a few words, but Joe essentially studies how animals interact with their environment. Mostly he studies amphibians and "... is passionate about all things salamander," according to his Ph.D. advisor. His passion led to discovering a new monotypic genus of salamander (*Urspelerpes brucei*) during pursuit of his Ph.D. That's a significant event in any biologist's

career, and while Joe is definitely happy it happened, he modestly describes the event as pure luck. It would be difficult to find someone more qualified to give a summary of the importance of amphibians.

Joe was going to give us an overview of the amphibian problem using his own and others' research. He began with two studies that demonstrate not only amphibians (Houlahan et al., 2000) but also reptiles (Gibbons et al., 2000) are in decline. We all knew this, right? The challenges are to find out why they are in decline and why people should care. He knew that this audience didn't need convincing that amphibians have an inherent value in just existing, but admitted that was not an argument that would persuade everyone. Perhaps emphasizing amphibians as early indicators of stressful environments might convince skeptics. Joe covered studies that both confirm (Price et al., 2007; Southerland et al., 2004) and question (Beebe and Griffiths, 2005; Kerby et al., 2010) if amphibians are indicators that something is wrong. Joe's take on the subject was that some but not all amphibians may be used as "canaries in a coal mine." He admitted that he's found bullfrogs (*Lithobates catesbeianus*) living in water he wouldn't stick his finger into.

Joe cited several studies that support the value of biodiversity (Díaz et al., 2006; Loreau et al., 2001; Mendenhall et al., 2012). A diverse ecosystem is a healthy ecosystem, so just the mere existence of amphibians contributes to that. Despite their small size, their quantities can add up to real effects in the environment. He spoke of a study quantifying the biomass added to an isolated wetland by amphibians (Gibbons et al., 2006). It equaled 3000 lbs. or about the biomass of a giraffe. Amphibians are diverse and abundant. We have a better idea of what's harming them, but their impacts on the ecosystem still need study.

Why are amphibians so vulnerable and what's harming them? Amphibians are both terrestrial and biphasic, poikilothermic, and either can't, won't, or don't move far. Joe mentioned that black-bellied salamanders (*Desmognathus quadramaculatus*) seem to have a home range of merely 1.5 square meters (Peterman et al., 2008). Animals that are so in tune with the environment are susceptible to many threats, but the main threats are climate change, urbanization, and invasive species. Joe talked of the results of one of his studies demonstrating the

drastic decline in salamander diversity expected in the Appalachians if various forecast rates of global warming actually happen (Milanovich et al., 2010). The news is not good even when using the more optimistic of projections. Amphibians cannot easily shift to another locale when their habitat becomes disturbed. Urbanization not only destroys or reduces the quality of habitat, it also makes relocating and dispersal difficult or impossible for amphibians (Hamer and McDonnell, 2008). Invasive species can reduce the quality of resources. Joe is currently studying the effects of purple loosestrife monocultures on wood frogs (*Lithobates sylvaticus*) and spring peepers (*Pseudacris crucifer*) using a group of tubs set up on the roof of Loyola's biology building, a site with a great view of Lake Michigan. Joe says sometimes he wishes he were a tadpole. Invasive species such as cane toads (*Rhinella marina*) actually eat many native species. Or an invasive species can outcompete the native species, such as bullfrogs established in Asia.

We know amphibians are declining and we have a pretty good idea of the threats, but what effect do amphibians have on the environment? A lot more study needs to be done in this area, but there are some tantalizing results already. As early as 1983 Robert Davic was declaring salamanders a keystone species that control species below them in a stream, dictating the invertebrate composition (Davic, 1983, 2003). A friend of Dr. Milanovich attempted to replicate Davic's work. Using cages in streams with different populations of invertebrates and salamanders, Keitzer and Goforth (2013) determined that prey diversity was increased in the cages with two species of salamanders. Wyman (1998) looked at terrestrial salamanders and their effects on leaf litter. The more leaf litter the more diverse the ecosystem. He found that less leaf litter was lost in systems with salamanders than without. Whiles et al. (2013) studied a tropical stream that

contained tadpoles, knowing that chytrid fungus would soon be coming to that stream. In 2006 the stream had a plethora of tadpoles, an abundance of invertebrates and a slide showed rocks covered with green. In 2008, after the fungus wiped out the tadpole population, invertebrates decreased and a photo showed the same rock now brown and barren. Amphibians are great food for other organisms, though their importance as prey has not been well documented. Knowing that amphibians are abundant and eaten by nearly everything, we can guess that they contribute much to the ecosystem as prey. While research is ongoing, all the above examples show amphibians are important components of a healthy ecosystem.

Amphibians also affect the nutrients in an ecosystem. Using his own studies, Dr. Milanovich showed how nutrients are recycled by salamanders. Invertebrate prey contains phosphorus. When consumed by salamanders, some of the phosphorus is stored in the salamanders' bodies and some is excreted. The excreted phosphorus is taken up by plants that feed the invertebrates. Joe's latest findings show that salamanders store much more of the nutrients in streams than the more abundant invertebrates. And interestingly, He finds that 75% of what salamanders excrete is not readily available to plants, thus lengthening the storage period of valuable nutrients.

I know that all who read this will not want to read every paper upon which Dr. Milanovich based his talk, but perhaps you'd like to delve a bit deeper into the subject, so I'm listing the citations to most below. Some are very interesting, but perhaps it's sufficient to know that there's data to back up what we all know: amphibians are important, are in danger, and are definitely worth saving. The next time I have to defend that view, I'll be prepared.

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Unofficial Minutes of the CHS Board Meeting, January 17, 2013

President John Archer called the meeting to order at 7:47 P.M. at the Schaumburg Township District Library. Board members Aaron LaForge and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: Mike Dloogatch read the minutes of the December 13 board meeting, which were accepted..

Treasurer: Andy Malawy presented the December finances and pointed out that the year ended with the Society in the black. Andy reported that the CHS needs an updated version of QuickBooks with an anticipated cost of \$200–300. Jason Hood moved that Andy be allotted the funds necessary to purchase the updated version of QuickBooks. The motion passed unanimously.

Membership Secretary: Mike Dloogatch reported that CHS membership, as measured by the numbers of January *Bulletins* sent out, is holding fairly steady. The figure was 505 in 2011, 517 in 2012, 500 in 2013, and will be at least 504 in 2014. The list of expiring memberships was read.

Publications Secretary: Aaron LaForge was absent. Jason Hood said that he's asked Aaron to create @chicagoherp.org email addresses for the new board members. Mike Dloogatch has sent Aaron the index for Volume 48 of the *Bulletin*.

Committee Reports

Shows:

- Notebaert Nature Museum, first full weekend of each month.
- Fishing, Travel and Outdoor Expos, Rosemont and Schaumburg, January 23–26.
- Garfield Park Conservatory Members Party, January 29.
- Great Lakes Pet Expo, Milwaukee, February 1.
- Boy Scout Dinner, Lagrange Park, February 19.
- Reptile Rampage, Lake Forest, March 9.
- Kids' Expo, Schaumburg, March 8–9.
- Chicagoland Family Pet Expo, Arlington Racetrack, March 14–16.
- Walker Stalker Con, Rosemont Convention Center, March 14–16.
- NARBC, Tinley Park, March 15–16

ReptileFest 2014: Jason Hood and Andy Sagan have scheduled meeting for Saturday, February 8 to discuss the planning. More specialized publicity being looked into.

Junior Herpers: Jason Hood reported the January meeting had 13 in attendance despite weather. The February speaker is to be Brian Suson.

Grants: Mike Dloogatch will schedule a date for the grants committee meeting. He said that in 2013 the board allocated \$7,000 for grants, and that amount was awarded. This year we have 33 proposals to consider, and we already have over \$4,000 in the grants fund thanks in part to a generous donation from the Hobart M. Smith trust. Mike moved to allocate an additional \$7,000 for grants in 2014. The motion carried unanimously.

New Business

New herp laws: Jason Hood brought up changes made to reptile-related laws in various states and concerns with this state. He will stay in touch with Scott Ballard for Illinois information and updates. Society will continue to monitor laws.

National Herp Congress: Jason Hood requested to remain our contact with this organization. The board approved.

Notebaert shows: Teresa Savino would like to promote the Notebaert shows more to increase member participation. Jason Hood recommended personal invitations to potential volunteers.

CHS Library: Teresa Savino reported a surplus of outdated texts and monographs that the Society may no longer want to keep for the sake of space. John Archer requested a list of these books be presented next meeting for consideration. Teresa requested more up-to-date husbandry-oriented books and a more secure way to lend books. Mike Dloogatch moved to allocate \$500 per year to updating the library. The motion carried unanimously.

Security for electronic equipment: John Archer will investigate upgrades to fit appropriately into space allotted.

Friends of Scales link on website: Erica Mede requested a link to Friends of Scales Reptile Rescue on the Society website. The rescue is currently being recommended by the Society for relinquishments. Concerns about endorsing one rescue over another. Society position to remain neutral.

Chicago Wilderness: Jason Hood moved to renew the Society's membership to Chicago Wilderness for \$50. The motion carried unanimously.

Desert Tortoise Preserve Committee: Erica Mede moved to sponsor the Desert Tortoise Preserve Committee for \$30, and urged that the DTPC be considered as a potential benefactor of this year's ReptileFest. The motion carried unanimously.

Round Table

Jim Foster asked Mike Dloogatch for names on the Grant Committee.

Jason Hood encouraged all members to look up www.rexano.org

Linda Malawy would like a *Bulletin* reminder added to renew Illinois endangered species permits.

John Archer recommended that all board members read through Illinois Senate Bill 2362, which failed to pass in 2013. Scott Ballard plans to resubmit a version of this legislation in 2014, and the CHS needs to offer feedback on it.

The meeting was adjourned at 9:45 P.M.

Respectfully submitted by Erica Mede for the recording secretary

News and Announcements

2014 CHS GRANT RECIPIENTS

The CHS Grants Committee has chosen the CHS grant recipients for 2014. The committee consisted of John Archer, Michael Dloogatch, Jason Hood, Robert Jadin, Sarah Orlofske, Amy Sullivan and Steve Sullivan. This year we received 33 applications. After a difficult decision process, 12 grants were awarded, in varying amounts, as follows:

- John Andermann, Biology Department, San Diego State University. “Testing Species Limits and Modes of Speciation Within the Tiger Whiptail Lizard (*Aspidoscelis tigris*) Complex in the Sea of Cortés Using Next-generation DNA Sequencing Data,” \$750.
- Hollis A. Dahn, Department of Biology, University of Central Florida. “Examining Specific and Subspecific Diversity Within Two Monotypic Snake Genera,” \$1,000
- Eric J. Gangloff, Ecology and Evolutionary Biology, Iowa State University. “Using Metabolomics to Test Thermal Tolerance in the Terrestrial Gartersnake, *Thamnophis elegans*,” \$1,000.
- Jade Keehn, Department of Biology, University of Nevada, Reno. “Do Changing Abiotic and Biotic Conditions at Wind Farms Influence Behavior, Demography, and Species Composition in Desert Reptiles?” \$1,000.
- Jennifer Y. Lamb, Department of Biological Sciences, University of Southern Mississippi. “The Conservation Status and Genetics of Dusky Salamanders in the Gulf Coastal Plain,” \$1,000.
- Dustin A. Owen, Center of Excellence for Field Biology, Department of Biology, Austin Peay State University. “Impacts of Prescribed Fire on the Stress Physiology of Two Sympatric Snakes,” \$1,000.
- John G. Palis, Palis Environmental Consulting. “Conservation Status of Crawfish Frogs in Southernmost Illinois,” \$750.
- Jennifer Stabile, Department of Herpetology, Albuquerque Biological Park. “The Coqui Conservation Initiative: Population Assessment and Reproductive Study of the Mona Island Coqui Frog,” \$1,000.
- John Vanek, Department of Biology, Hofstra University. “Ecology of Eastern Hognose Snakes on a Barrier Island,” \$1,000.
- Jessica Marie Vannatta, Department of Biology, Middle Tennessee State University. “Seasonal Corticosterone and Leukocyte Levels, Presence of Ranavirus, and Demographic Characteristics of the Eastern Box Turtle, *Terrapene carolina carolina*, in a Wetlands Habitat of Middle Tennessee,” \$1,000.
- Kai Wang, Washington State University. “Courtship Behaviors of the Newly Described Diannan Crocodile Newt, *Tylototriton yangi*: Total Evidence of its Validity and Phylogenetic Relationship,” \$780.
- Denita M. Weeks, Department of Biological Sciences, University of Memphis. “Impacts of Larval Stress on Development of Adult Skin Defenses in Anurans,” \$1,000.

Advertisements

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, PO Box 430, Newberry, FL 32669-0430, 352-472-9189, E-mail: GrmtRodent@aol.com.

For sale: **highest quality frozen rodents**. I have been raising rodents for over 30 years and can supply you with the highest quality mice available in the U.S. These are always exceptionally clean and healthy with no urine odor or mixed in bedding. I feed these to my own reptile collection exclusively and so make sure they are the best available. All rodents are produced from my personal breeding colony and are fed exceptional high protein, low fat rodent diets; no dog food is ever used. Additionally, all mice are flash frozen and are separate in the bag, not frozen together. I also have ultra low shipping prices to most areas of the U.S. and can beat others shipping prices considerably. I specialize in the smaller mice sizes and currently have the following four sizes available: Small pink mice (1 day old—1 gm), \$25 /100; Large pink mice (4 to 5 days old—2 to 3 gm), \$27.50 /100; Small fuzzy mice (7 to 8 days old—5 to 6 gm), \$30/100; Large fuzzy mice /hoppers (10 to 12 days old—8 to 10 gm), \$35/100 Contact Kelly Haller at 785-234-3358 or by e-mail at kelhal56@hotmail.com

For sale: High quality, all locally captive-hatched tortoises, all bred and hatched here in the upper Midwest. Baby leopards, Sri Lankan stars, and pancakes usually available, and are all well-started and feeding great! Leopards are \$125 ea., Sri Lankans (2012 hatched) \$475 ea. And Pancakes are \$195 ea. Leopards for out of state sale/shipping require a veterinary health certificate (inquire for cost). E-mail at KKranz1@wi.rr.com or call Jim or Kirsten at 262 654 6303.

Herp tours: **Costa Rica herping adventures**. Join a small group of fellow herpers for 7 herp-filled days. We find all types of herps, mammals, birds and insects, but our target is snakes. We average 52 per trip, and this is our 10th year doing it. If you would like to enjoy finding herps in the wild and sleep in a bed at night with air-conditioning, hot water and only unpack your suitcase once, instead of daily, then this is the place to do it. Go to our web-site <http://hiss-n-things.com> and read the highlights of our trips. Read the statistics of each trip and visit the link showing photos of the 40 different species we have found along the way. E-mail at jim.kavney@gmail.com or call Jim Kavney, 305-664-2881.

Herpetological Researcher/Educator Internships! Research 4 Reptiles, LLC. is seeking two volunteer interns, ages 18 years and older, for the Summer 2014 season to assist in all aspects of herpetological research and educational classes. Our mission is to provide challenging, hands-on, field-based programs for participants ages 10 years and older to inspire enthusiasm for and understanding of native Illinois reptile and amphibian species. All educational programs are taught entirely outdoors at Midewin National Tallgrass Prairie in Wilmington, Illinois, and are limited to 8 participants. Internship details can be found on our website at: <http://www.research4reptiles.biz>. Email Holly Zak at research4reptiles@comcast.net or call 630-337-0757 for questions.

Line ads in this publication are run free for CHS members — \$2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to mdloogatch@chicagoherp.org.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, February 26, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Sarah Orlofske**, assistant professor of biology at Northeastern Illinois University, will speak on “Amazing Amphibians of the Peruvian Amazon: Diversity, Research and Outreach.” The herpetological diversity of the Madre de Dios region of Peru has fascinated scientists for decades. However, new discoveries continue to be made and future research is needed to understand these incredible species and their interactions with the rapidly changing environment. This talk will provide a glimpse of the overall diversity with an in-depth look at some remarkable species, and will highlight research and outreach activities.

The speaker at the March 26 meeting will be former CHS president **Chris Lechowicz**, who now lives in Fort Myers, Florida, and is employed as a herpetologist at the Sanibel-Captiva Conservation Foundation. Chris will present a summary of his thesis work on the map turtles of the Choctawhatchee and Pea Rivers in southern Alabama and northern Florida. Chris received a grant from the CHS in 2007 for this project. Chris will also debut his first book, *Amphibians and Reptiles of Sanibel and Captiva Islands, Florida: A Natural History*, and have copies available.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago’s newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

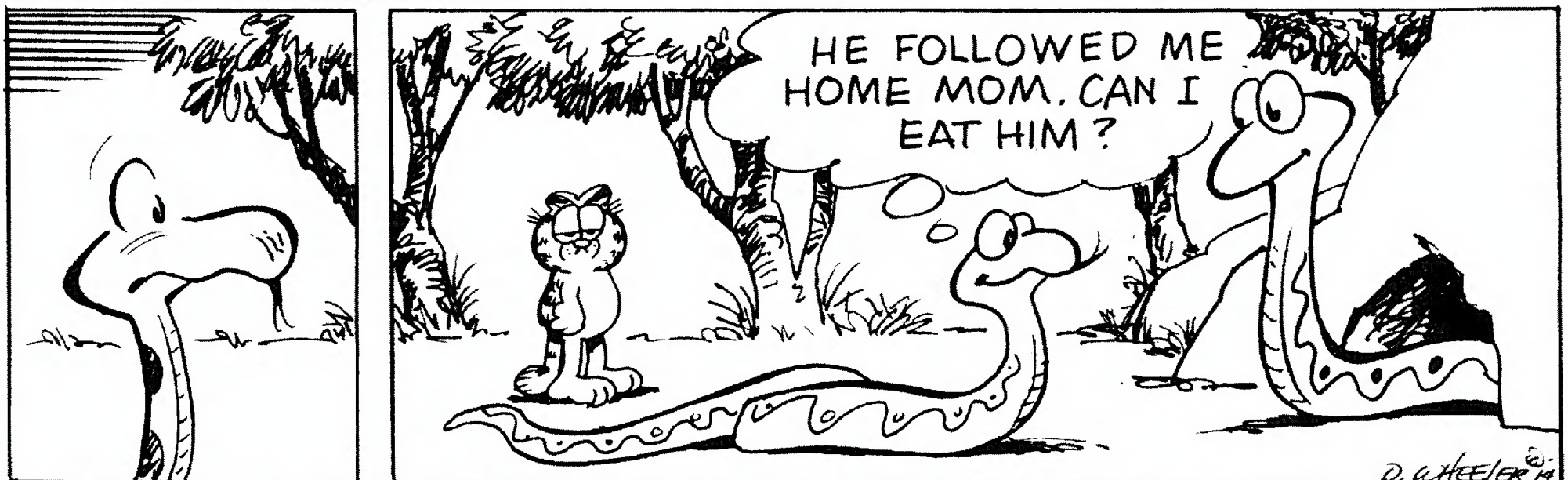
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., March 21, at the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg..

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the group’s Facebook page.

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